## THE SHARMAN SYSTEM OF WIRELESS TELEPHONY AND TELEGRAPHY.

WIRELESS telephony by induction and conduction has of late years occupied an insignificant position, owing to the efforts that have been made to obtain satisfactory transmission of speech by means of undamped oscillations, such as are produced with the "singing arc." But provided that a reasonable distance can be overcome, the conduction system is one which demands serious attention on account of the small amount of power required and the simplicity of the apparatus.

The system on which Mr. A. W. Sharman has been at work for some time is based on the earlier experiments of Preece, but its essential feature is the "impulse coil," with which the microphonic currents are intensified before transmission through the conductive medium.

During the past twelve months the writer has had various opportunities of working with Mr. Sharman's apparatus, both on land and sea, and there has been ample proof of the possibilities of the system, as with a primary energy of only a few watts clear telephonic communication has been established at distances ranging between half a mile and a mile and a half.

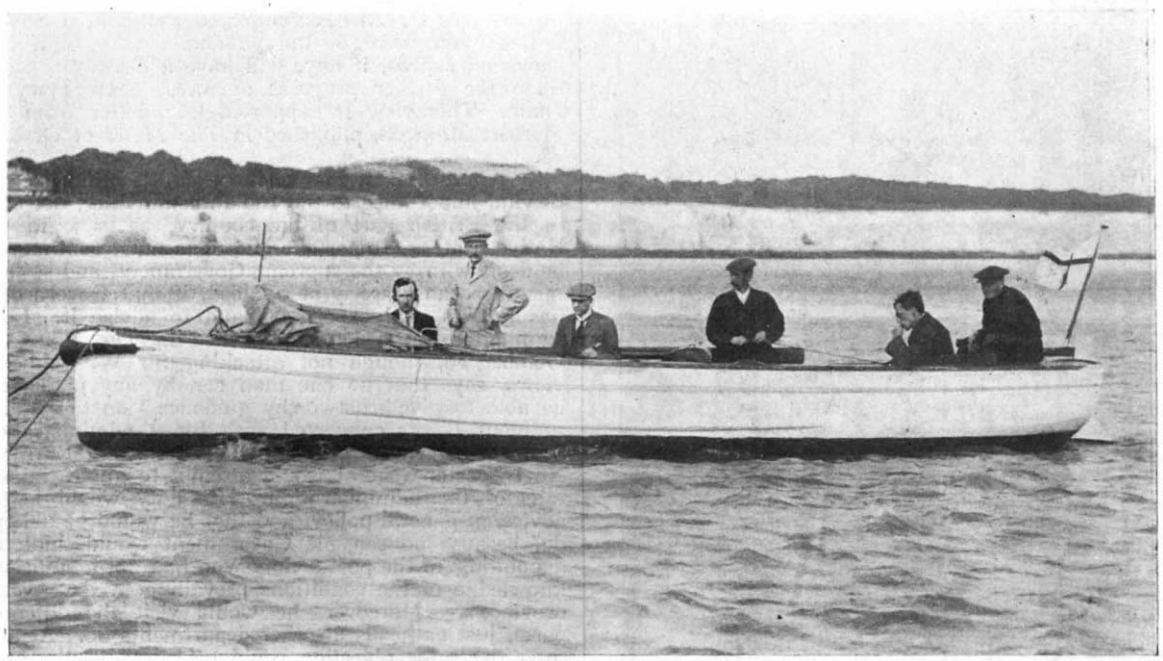

FIG. 1.—Motor Boat fitted with the Sharman Apparatus for Wireless Telephony.

The speaking apparatus consists of a microphone, battery, and impulse coil, all of which are in series; tappings are taken off the coil, the two wires leading to metal electrodes, which are either stuck in the ground or submerged in the water, as the case may be. The impulse coil consists of a comparatively low number of turns of thick copper wire, wound round a soft iron composite core of special construction, and the result is that with every variation in resistance of the microphone, when someone is talking, a momentary current of great intensity is induced. This is "transformed down" by the portion of the coil used for transmitting the impulse to the conductive medium, the coil thus serving additionally as an auto-transformer. The wires leading from the impulse coil may be from ten feet in length upwards; thus with two ten-foot wires there would be a possible distance of twenty feet between the extreme ends; the ends are attached to plates or rods—stair-rods proving eminently practical for placing in the earth.

The receiving circuit consists of two similar electrodes, which are placed in series with the telephone receiver. A change-over switch in the instrument enables one to speak or listen at will.

There appear to be several factors upon which the limit of clear speech transmission depends. Thus with a wider base line, *i.e.* a greater distance between the electrodes, longer distances can be covered, while with an increase in the battery power used with the microphone a similar result is obtained. There is a serious limit, of course, to increasing the primary energy, as the microphone will not admit of the use of more than eight or ten volts in practice; various forms of microphone have been tried, and those permitting of the use of the highest voltage and largest amount of current have proved the most successful.

A number of experiments have been made with the earth as the conducting medium, and distances of a mile have been covered without difficulty; the nature of the ground does not appear to be a very important factor, as good speech has been transmitted through chalk, gravel, and various other soils, also from the interior of coal mines at a depth below the surface of nearly one thousand feet; in the latter case a number of different strata separated the two instruments, without any apparent detriment to the speech.

The electrodes appear to act as the foci of an elliptical disturbance, which travels chiefly in the direction at right angles to the major axis, and not at all in the line joining the two points. It is thus desirable to have the two base lines parallel, and the necessity for this provides a means of directing the energy, so that with a flexible base line, speech will only be carried in certain desired directions, and cannot readily be "tapped" in other directions. The directional effect was very noticeable in experiments recently carried out on the sea at Pegwell Bay, near Ramsgate, even when the distance between the water "plates" was a hundred feet and more.

A particular feature of the conduction system is that it is not superficial, as was at one time suspected. The clear telephonic conversation carried out between the low level in a mine and the surface dispelled the idea altogether, and hence no difficulty would be experienced in speaking from a battleship to a submarine, even when the latter was submerged to a very considerable depth.

In the experiments recently carried out by Mr. Sharman, a motor-boat was employed as the floating station, and two plates of iron buried in the sand led up to a shore station situated in a room in an inn on the cliff. Speech was carried on very distinctly on some occasions over a distance of a mile and a quarter, but there were some apparent variable factors, possibly water temperature, which prevented an absolute uniformity of results. An interesting point is that, when the tide was some distance out, there being half sand, half water, between the two stations, the speech was quite perfect, so that it is improbable that

FIG. 2.—The Wireless Telephone Apparatus in use.

there is any refraction of the waves at the separating surface. It is possible that the currents were transmitted through the sand right up to the position immediately under the motor-boat, selecting the shortest path through the water, for, in the writer's opinion, increase in the conductivity of the separating medium does not by any means agree with increase in the loudness of the transmitted speech.

Considering the very small amount of primary energy used, the results so far obtained have been surprisingly good, and it is to be hoped that efforts to find a microphone capable of withstanding heavier currents will meet with success. The extreme simplicity of the system and insignificant bulk of the apparatus used are in themselves points which place it at once on a level with commercial telephony over wires. A great advantage of the system is that telephony or telegraphy are available at will, as impulses can be generated by means of a Morse key and low-resistance tuned buzzer, and signals transmitted over at least double the distances at present possible for speech. There is undoubtedly the prospect of considerable development in a system based on such simple foundations, and Mr. Sharman's future work in this direction will be watched with interest.

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## FORESTRY IN INDIA.

IN the issue of NATURE of October 12, attention was directed to Lord Curzon's spirited protest against the change of system in regard to the preservation of the ancient monuments of India. In a letter published in *The Times* of October 11, Sir W. Schlich enters a similar protest against the proposed abolition of the post of Inspector-General of Forests, the technical adviser of the Government of India on all questions referring to the administration of the forests of India. He points out the immensce progress made during the last forty-seven years in the systematic management of the forests covering one-fourth of the total area of British India, a progress chiefly due to the initiative of successive inspectors-general of forests. He believes that the contemplated abolition, if carried out, for the sake of the possible saving of a few thousand rupees, if any, will have a disastrous effect upon the further progress of forest conservancy in India. This view is supported in a letter from Sir Herbert Maxwell, published in *The Times* of October 18.

Systematic forest management on scientific lines is of vital importance to the Indian community, not only in the British part of the country, but also in the Native States. Important questions must continue to be dealt with by the supreme Government, and serious mistakes can scarcely be avoided, if that Government has not its own expert at hand to advise it. Lord Lamington, in a letter published in *The Times* of October 20, though not attacking Sir W. Schlich's views, says that no one man can by any possibility be able to give trustworthy guidance "on the multitudinous points connected with forest administration over such a vast area as that of India and Burma." No Inspector-General would attempt to guide the details of the administration. His duty would be to advise on general policy, and that he would be able to do, because no sensible Government would think of appointing to the post a man who had not a sufficient knowledge of the conditions prevailing in the several provinces. Moreover, he would visit the different parts, just as heads of other departments do. At any rate, the same objection could be raised in the case of any other branch of the administration.

Decentralisation is desirable in such a large country as India, but it must not go so far as to deprive the supreme Government of the necessary technical advice. The Government of India will still have to deal with numerous questions, such as the establishment of further reserved State forests, legislation in connection with it, the general lines on which the management of the forests is to proceed, the control of the Imperial Forest College at Dehra Dun, the Research Bureau and its labours, extending over the several provinces, advice to Native States as regards forest administration, the education of the Imperial forest staff, as well as of the superior provincial staff, the organisation and reorganisation of the superior and subordinate staff, and last, but not least, the control of forest finance. Without a duly qualified technical adviser at headquarters, these questions cannot possibly be dealt with in a satisfactory manner. No doubt, the Secretary of State for India will take all these matters into consideration when dealing with the proposals now before him.